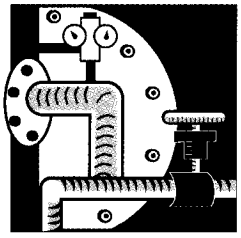


Steam Challenge Showcase CASE STUDY

a Program of the U.S. Department of Energy

THE CHALLENGE: INCREASING PROCESS AND ENERGY EFFICIENCY AT A PLYWOOD PLANT

Summary

Georgia Pacific Corporation was looking for opportunities to reduce purchased fuel costs at its Madison, Georgia plywood manufacturing plant. By insulating steam lines with mineral fiber and replacing 70 steam traps, the Madison plant was able to reduce fuel costs, increase process efficiency, and improve plant safety. This Steam Challenge Showcase Project resulted in annual savings of $138,560, providing a payback of approximately 6 months. The project also improved the plant's environmental performance by reducing air pollutant emissions and ash generation.

Plant Overview

Located in Madison, Georgia, 50 miles east of Atlanta, Georgia-Pacific's plywood plant uses locally grown loblolly pine to manufacture plywood. The plant, built in 1979, employs 400 people and operates continuously, 24 hours per day, 7 days a week.

Project Background

Georgia-Pacific was looking for ways to increase process efficiency and reduce fuel costs at its Madison plant. Although the plant typically uses wood bark and other wood byproducts to fuel its boilers, at certain times throughout the year not enough bark is available and additional fuel must be purchased. By increasing process energy efficiency, the plant could reduce its purchases of fuel from outside sources.

Project Team

To identify opportunities to insulate steam lines, Georgia-Pacific formed a project team consisting of Darryl Jackson, Boiler Superintendent at the Madison plant; Stevie Jones, a representative of the North American Insulation Manufacturers Association (NAIMA); and William Brayman, Vice President of Marketing and Technical Services, Rock Wood Manufacturing, Inc. Representatives

Georgia Pacific Corporation, Madison, Georgia Plywood Plant

Products: Plywood

SIC: 2436

Location: Madison, Georgia

Employees: 400

Showcase Team Leaders: Darryl Jackson, Georgia Pacific Corporation; Stevie Jones, NAIMA; William J. Brayman, Rock Wool Manufacturing Inc.

Company Energy Philosophy: Georgia-Pacific is committed to reducing the amount of fossil fuel and purchased electricity consumed per unit for product produced. The company seeks to improve efficiency through careful planning and increased use of self generated and renewable fuels.

Project Profile

Process: Electricity Generation

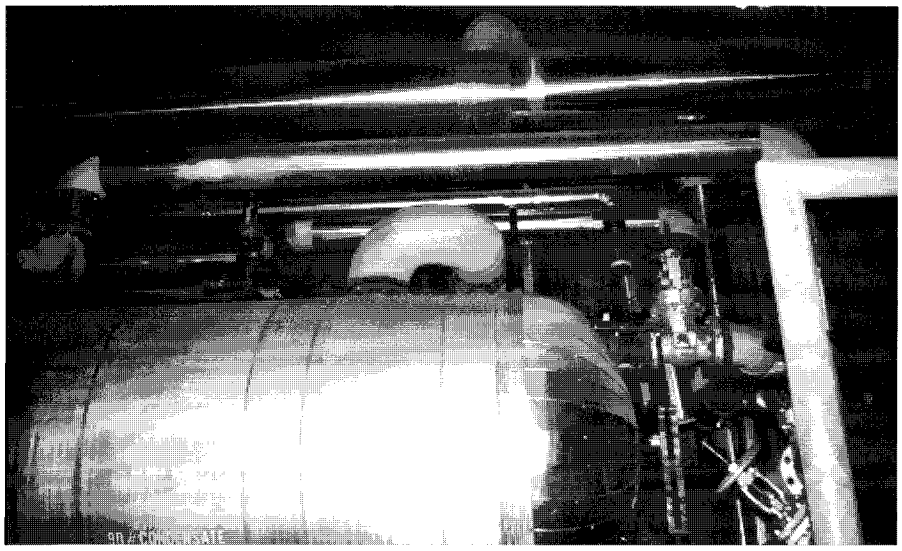
System: Steam Distribution

Technology: Insulation of Steam Lines and Improved Steam Traps

Performance Improvement Summary

Energy and Cost Savings and Annual Emissions Reductions

Project Implementation Costs	$69,280
Annual Energy Cost Savings	$138,560
Simple Payback	6 months
Annual Energy Savings	62,899 MMBtu
CO_2	34,600,000 lbs
Carbon Equivalent	9,450,000 lbs
SO_2	3,460 lbs
NO_x	26,000 lbs
PM-10	29,400 lbs
TOCs	3,120 lbs
CO	236,000 lbs
Lead	6 lbs



Steam Pipes

of the U.S. Department of Energy's Steam Challenge program confirmed the resulting energy savings.

The Old System

Plywood is manufactured by gluing together layers of wood, known as veneer. Logs arrive at the mill in sections and are immediately debarked and soaked in warm water (180°F) for six hours. This softens the wood and makes it easier for the plant's processing equipment to peel off layers of wood from the log. Once the logs are sufficiently softened, they pass through a lathe that shaves off layers of wood veneer. The veneer is then sent to a dryer where it is subjected to 405°F heat. From the dryers the veneer is sent to the glue line where it is layered with glue and pressed into a plywood panel. Once pressed, the panels are trimmed on a saw line and banded for shipment.

In the old system, steam lines to the mill's four dryer were uninsulated. Heat was lost from the 1500 feet of saturated steam lines all day long, wasting energy and reducing the temperature in the dryer. The drop in temperature in the dryer increases the veneer's drying time, which in turn slows down the entire plywood manufacturing process. In addition to wasting energy and reducing process efficiency, the uninsulated steam pipes, which operate at 437°F, also presented a danger to plant personnel.

Alternatives Considered

Using 3E Plus, a software program developed by the NAIMA, the project team estimated that insulating the steam pipes significantly reduces heat loss along the lines leading to the dryers. Preventing this heat loss increases the dryer's operating temperatures by 15°F and maintains a consistent process temperature throughout the steam lines. Together these improvements result in a faster, more efficient plywood manufacturing process. In addition, insulating the steam lines results in significant energy savings.

The New System

Based on calculations by the E3 Plus software, the Madison plant installed 2-inch mineral fiber glass pipe insulation on all of its steam lines. This was the most effective insulation thickness, minimizing annual system operating costs while achieving the goals of reducing heat loss, maintaining process temperature, and reducing pipe surface temperature to protect plant personnel. In total, 970 feet of insulation was added to the plant's process steam lines. Insulation footage was as follows: 120 feet of insulation on the twelve-inch process line; 200 feet on the eight-inch process line; 220 feet on the six-inch process line; 80 feet on the four-inch process line; and 350 feet on the 1-1/2-inch process line. While installing the insulation, the team also replaced 70 steam traps. The new traps resulted in a 10 percent increase in condensate return, further increasing energy savings.

3E Plus

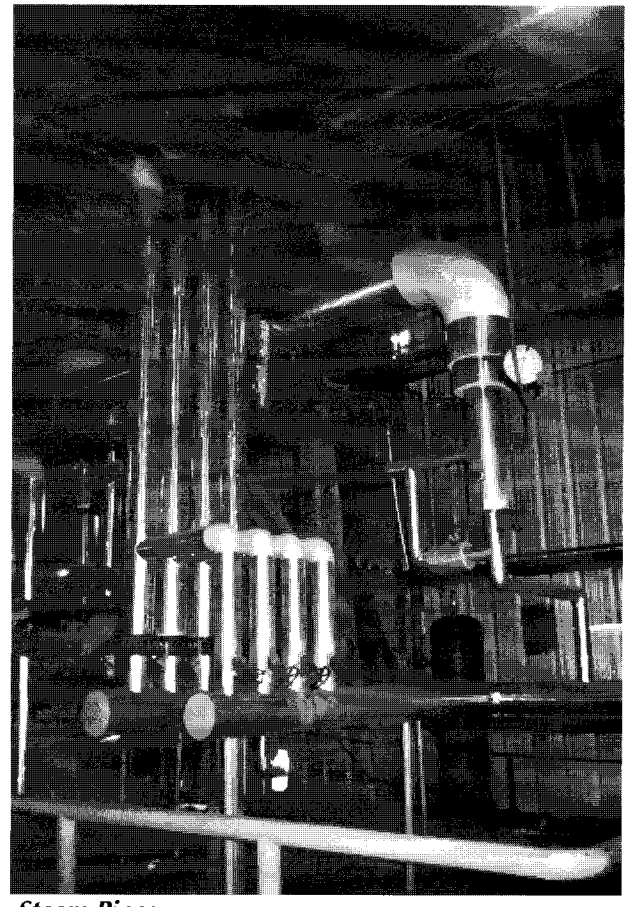
3E Plus is a computer program that provides the user with a simplified and systematic method for determining adequate insulation thickness. 3E Plus helps to answer questions like:

- How much should I insulate?
- How much will insulation save versus other equipment investments?
- What is the payback period?

3E Plus can be downloaded from NAIMA's website at www.pipeinsulation.org.

Results

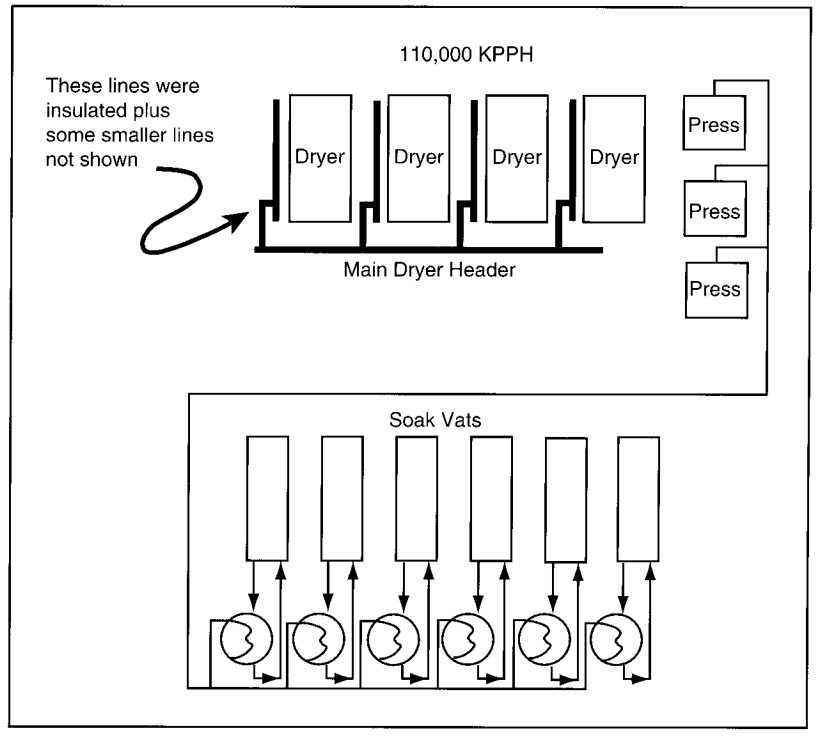
By insulating the mill's steam lines and replacing steam traps, the Madison plant benefited in a number of important ways. First, it reduced steam usage by approximately 6000 lbs per hour, equivalent to saving 18 tons of fuel per day or $52,560 per year. This has enabled the plant to eliminate the purchase of additional fuel, and has allowed the plant to sell some of their excess fuel to a nearby paper company. By reducing fuel consumption, the plant also reduced air pollutants, including a reduction in CO_2 emissions of 5 to 6 percent, decreased the amount of ash being generated and landfilled, and reduced surface temperatures of the steam lines from 400°F to a much safer 85°F. The hotter, more consistent temperatures in the dryers also decreased drying time, which resulted in a faster, more efficient veneer plywood process. Replacing 70 thermal dynamic steam traps allowed the plant to increase condensate return by 10 percent, resulting in additional annual savings of $86,000 (based on a fuel cost of $8 per ton). Based on total annual savings of $138,560, the payback period for the improvements is approximately six months.



Steam Pipes

Lessons Learned

A couple of important lessons were learned from this project. Firstly, gauging the results of a project like this can be complex. Georgia Pacific found that the best way to calculate the effectiveness of the insulation was to carefully track fuel use before and after the project. Secondly, since mineral fiber insulation was used, no downtime was required to insulate the steam lines. Those areas that could not be insulated while the line was in use were insulated during the once-a-week, scheduled dryer maintenance period.



Power Station Steam Flow Diagram

Other Applications

Installing insulation is one of the easiest ways for an industrial plant to reduce energy consumption and greenhouse gas emissions. Compared to many other energy efficiency improvement opportunities, industrial insulation is low cost, easy to install, and yields a very fast payback. A 1996 report co-authored by the Alliance to Save Energy and Energy Conservation Management estimated that if U.S. industry increased

insulation thickness in existing steam processing lines, boilers, tanks, process equipment, and ducting to the most economic thickness, the United States could save 51.3 trillion Btu and avoid 1.18 billion pounds of CO_2 annually. If this estimate took into account uninsulated piping and equipment as well, the savings would be even greater.

About Steam Challenge

The Steam Challenge is a public-private initiative sponsored by the U.S. Department of Energy (DOE). DOE is developing this partnership initiative with the Alliance to Save Energy, a national nonprofit organization based in Washington, DC, to promote the comprehensive upgrade of industrial steam systems. The Steam Challenge encourages industrial energy consumers to retrofit their steam plants wherever profitable.

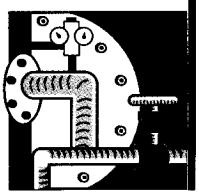
Improving the energy efficiency of industrial steam systems is a powerful tool to help U.S. manufacturers improve productivity and lower production costs. It can also help reduce emissions that can cause pollution and climate change.

The goals of Steam Challenge are to improve competitiveness through enhanced productivity and lower production costs, provide steam plant operators with the tools and technical assistance they need to improve the system efficiency of their steam plants, and promote greater awareness of the economic, and energy, and environmental benefits of efficient steam systems.

For more information, contact:

Fred Hart
U.S. Department of Energy
Office of Industrial Technologies
1000 Independence Avenue, SW
Washington, DC 20585
Phone: (202) 586-1496
Fax: (202) 586-7114

Ted Jones
Alliance to Save Energy
1200 18th Street, NW, Suite 900
Washington, D.C. 20036
Phone: (202) 857-0666
Fax: (202) 331-9588



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